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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/865,732	05/29/2001	Shinya Yamaguchi	826.1727	5963
21171 7590 10/22/2007 STAAS & HALSEY LLP SUITE 700 1201 NEW YORK AVENUE, N.W. WASHINGTON, DC 20005			EXAMINER GUILL, RUSSELL L	
			ART UNIT 2123	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

09/865,732

Applicant(s)

YAMAGUCHI ET AL.

Examiner

Russ Guill

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2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 August 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 May 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. This action is in response to the Request for Continued Examination filed August 23, 2007. No claims have been canceled. Claim 13 has been added. Claims 1 - 13 have been examined. Claims 1 - 13 have been rejected.
2. As recited previously, again the Examiner would like to thank the Applicant for the well-presented response, which was useful in the examination process. The Examiner appreciates the effort to analyze the Office Action, and make appropriate arguments and amendments.

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 23, 2007, has been entered.

Response to Remarks

4. Regarding claims 1 - 12 rejected under 35 USC § 101:
 - 4.1. The Applicant's arguments have been fully considered, and are persuasive, and accordingly, the rejections corresponding to the arguments are withdrawn.
 - 4.2. The Applicant argues:
 - 4.3. Applicant's disagree with the Examiner's statements in section 5.6.1.2 on page 4 of the Office Action. In fact, the Examiner's statement that "although a simulation device is known to produce or output a result,

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it does not necessarily output a result" is evidence that a simulation device can output a result (emphasis added). Based on the Examiner's circular statements, it appears the Examiner attempts to change the scope of the Applicant's invention. The claimed invention clearly recites that the simulation apparatus comprises an output device which calculates a receiving characteristic of an object and then outputs the receiving characteristic of the object.

- 4.4. The Examiner alleges that the claims recite merely an abstract idea. Independent claims 1 and 6-12 recite the feature of "outputting the receiving characteristic," and independent claim 5 recites the feature of "outputting the directivity characteristic." The mere result of outputting a "characteristic" for a simulation apparatus provides a useful, concrete, and tangible result. Claims 1 and 5-12 recite either a simulation apparatus for simulating, a computer-readable storage medium on which is recorded a program process for controlling and enabling a computer to simulate, a process of simulating, or a method of simulating within the technological arts, thereby providing a useful, concrete, and tangible result.
- 4.5. MPEP § 2106 states that subject matter outside patentable statutory subject matter is limited to abstract ideas, laws of nature, and natural phenomena, where the claimed subject matter is not a *practical application or use* of an idea, a law of nature or a natural phenomena. Thus, a claim to an "abstract idea" is non-statutory when it does not represent a practical application of the idea. A claim is limited to a practical application when the method, as claimed, produces a concrete, tangible and useful result (see, MPEP § 2106).
- 4.6. As recited in independent claim 1, for example, the simulation apparatus comprises an output device which calculates a receiving characteristic of an object and then outputs the receiving characteristic of the object. A simulation device is known to produce or output a result. Accordingly, a concrete, tangible and useful result is achieved not only by calculating a receiving characteristic of an object but also by outputting the receiving characteristic of the object. (see, State Street Bank & Trust Co. v. Signature Financial Group Inc. 47 U.S.P.Q.2d 1596 (Fed. Cir. 1998)).

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4.7. Therefore, it is respectfully submitted that because independent claims 1 and 5-12 and dependent claims dependent therefrom satisfy the requirements of 35 USC §101, withdrawal of the rejection is requested.

4.8. In view of the above, it is respectfully requested that the rejection is overcome.

5. Regarding claims 1 - 12 rejected under 35 USC § 103:

5.1. The Applicant's arguments have been fully considered, but are not persuasive.

5.2. The Applicant argues:

5.3. The Examiner maintains that the combination of Nishino, Otsu, and Cheng discloses the claimed invention.

5.4. However, Nishino does not disclose or suggest "a first current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns," "a current storage device storing the current values of the generation source," and "a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants."

5.4.1. The Examiner respectfully replies:

5.4.2. The recited limitations appear to be the limitations of claim 1. The arguments appear to be an introduction, however, it is noted that the arguments are simply allegations without specifically pointing out how the language of the claims patentably distinguishes them from the references.

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5.5. The Applicant argues:

- 5.6. The Examiner continues to rely on features in the Nishino reference that are not the same as the claimed "first current calculation device," "current storage device," and "second current calculation device" (see page 12, sections 9.5.1 through 9.5.3 of the Office Action). For example, the Examiner alleges that the features in column 7, lines 7-9 of the Nishino is analogous to the claimed "first current calculation device."
- 5.7. Yet, in column 7, lines 7-9, Nishino discloses that "the first calculation unit 12 calculates the current distribution in the applicable sections of the electronic circuit device by applying the distributed constant circuit method." It is evident from this feature that Nishino fails to disclose or suggest "a first current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns." As further evidence that Nishino is not concerned with calculating current values of a generation source, Nishino clearly discloses that "the wavesources, which are induced by the current, **are not taken** into account because the currents are very small in the inapplicable section" (see column 7, lines 19-21, emphasis added).
- 5.8. Thus, the Examiner's allegations on page 12, sections 9.5.1 through 9.5.3 of the Office Action are erroneous.

5.8.1. The Examiner respectfully replies:

- 5.8.2. First, while the Applicant alleges that the rejections rely on features in the Nishino reference that are not the same as the claimed "first current calculation device," "current storage device," and "second current calculation device", only the "first current calculation device" is specifically addressed. Therefore, regarding the "current storage device," and "second current calculation device", Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general

allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

- 5.8.3.** Second, Nishino is only relied upon to teach a "first current calculation device calculating current values", rather than "a first current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns." The remainder of the limitation is addressed by Otsu and Cheng.
- 5.8.4.** Third, the "first current calculation device" appears to calculate current values of a generation source as further evidenced by Nishino, column 6, lines 6 – 10, which recites calculating currents in a receiving section based on the current distribution calculated by the first calculation unit. Therefore, the first calculation unit calculates currents in a generation source. Further, Nishino clearly discloses that "the wavesources, which are induced by the current, **are not taken** into account because the currents are very small in the inapplicable section", but this statement refers to the wavesources induced in a receiving antenna that have a back reaction on the transmitting antenna.

5.9. The Applicant argues:

- 5.10.** With regard to the features of the present invention in which a check is made to determine whether a distance between a transmitting antenna (a source) and a EUT (an object) is greater than or equal to a prescribed threshold distance, the Examiner makes a broad conclusory statement in section 6.8.2 on page 7 of the Office Action.

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- 5.11. The Examiner asserts, "Cheng recites that the transmitting and receiving antennas need to be separated by very large distances in order for the coupling impedance to be neglected as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna, and therefore, there would have been a check for separation distance between the source and the receiving object to ensure that the equations were applicable."
- 5.12. Here, the Examiner relies on broad conclusory statements, subjective belief, and unknown authority in his assertions because none of the features of the present invention are disclosed or suggested by Cheng. Cheng does not disclose or suggest that if a threshold is met, the calculation of source current values using a first set of simultaneous equations and the storing of these current values as constants is performed.
- 5.13. MPEP § 2142 states that "[w]hen the motivation to combine the teachings of the references is not immediately apparent, it is the duty of the examiner to explain why the combination of the teachings is proper." The Examiner is required to present actual evidence and make particular findings related to the motivation to combine the teachings of the references. In re Kotzab, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000); In re Dembiczak, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). Broad conclusory statements regarding the teaching of multiple references, standing alone, are not "evidence." Dembiczak 50 USPQ2d at 1617. "'The factual inquiry whether to combine the references must be thorough and searching.'" In re Lee, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002) (citing McGinley v. Franklin Sports, Inc., 60 USPQ2d 1001, 1008 (Fed. Cir. 2001)). The factual inquiry must be based on objective evidence of record, and cannot be based on subjective belief and unknown authority. *Id.* at 1433-34. The Examiner must explain the reasons that one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious. In re Rouffet 47 USPQ2d 1453, 1459 (Fed. Cir. 1998).

5.13.1. The Examiner respectfully replies:

5.13.2. After reviewing the recited section 6.8.2, the section appears to explain the reasoning behind why it would have been obvious to the ordinary artisan to use a distance threshold to determine if it would be appropriate to use a far field approximation. Further, the use of a distance threshold was common knowledge in the art, using Cheng as a supporting reference. The motivation to use the common knowledge in the art would have been the nature of the problem, wherein it would have been necessary to determine if it was appropriate to use a far field approximation.

5.14. The Applicant argues:

- 6.** The Examiner has not presented any evidence why Nishino, Otsu, and Cheng would have been combined. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. MPEP § 2143.01. Specifically, there must be a suggestion or motivation in the references to make the combination or modification. *Id.* The Examiner's sole support for such a combination is "the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device...which would have been recognized by the ordinary artisan as a computational benefit to save time" (see section 9.10 on page 17 of the Office Action) and "the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately because the back reaction of the receiving antenna on the transmitting antenna can be set to zero...which would have been recognized by the ordinary artisan as providing a computational time saving benefit" (see section 9.11 on page 17 of the Office Action).
- 6.1.** The Examiner cannot rely on the benefit of the combination without first supporting the motivation to make the combination. Such motivation does not appear anywhere in either of the references, and the Examiner has not presented any actual evidence in support of the same. Instead, the Examiner relies on broad conclusory statements,

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subjective belief, and unknown authority. Such a basis does not adequately support the combination of references; therefore, the combination is improper and must be withdrawn.

6.1.1. The Examiner respectfully replies:

6.1.2. As recited above, a computational time saving benefit would have resulted by using the art of Otsu with the art of Nishino, which would have been recognized by the ordinary artisan. Also as recited above, a computational time saving benefit would have resulted by using the art of Cheng with the art of Nishino, which would have been recognized by the ordinary artisan. These benefits provide the motivation to combine the references.

6.2. The Applicant argues:

6.3. Accordingly, it is submitted that none of the cited prior art references, either alone or in combination, discloses or suggests the features as recited in claims 1-12 of the present invention.

6.4. In view of the above, it is respectfully submitted that the rejection is overcome.

6.4.1. The Examiner respectfully replies:

6.4.2. Applicant's arguments have been fully considered, but are not persuasive, as discussed above. Accordingly, the rejections are maintained.

Claim Objections

7. Claim 13 is objected to for the following minor informality: the claim recites in line 8, "is changes", which does not appear to be an appropriate phrase. For the purpose of claim examination, the phrase is interpreted as, "is changed".

Claim Rejections - 35 USC § 112

8. As an initial issue, the Applicant is respectfully requested to please note that when filing an amendment an Applicant should show support in the original disclosure for new or amended claims. See MPEP 2163.

9. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

10. Claim 13 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

- 10.1. Claim 13 recites, "each equation in the first set representing a current of each of a plurality of elements composing the transmitting antenna". The limitation does not appear to be described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Each equation does not appear to represent a current.

- 10.2. Claim 13 recites, "each equation in the second set representing a current of each of a plurality of elements composing the receiving antenna". The limitation does not appear to be described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Each equation does not appear to represent a current.

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10.3. Claim 13 recites, "calculating the current value of the receiving antenna". The limitation does not appear to be described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The receiving antenna appears to have a plurality of current values.

10.4. Claim 13 recites, "calculating the current value of the transmitting antenna". The limitation does not appear to be described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The transmitting antenna appears to have a plurality of current values.

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

12.1. Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are at least: in the second set of simultaneous equations for the receiving antenna, the current values from the transmitting antenna are used as constants. This element appears to be critical to the invention.

Claim Rejections - 35 USC § 101

13. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

13.1. Claims 7, 8 and 11 - 12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

13.2. Regarding independent claims 8, 11 and 12, the recited simulation apparatus and method appear to contain abstract ideas such as calculating current values. Therefore, in order to be statutory, the claims must be directed to a practical application producing a concrete, useful and tangible result. The claims do not appear to produce a tangible result needed to support a practical application when the distance between the object and the source is less than a threshold difference. The claims must always produce a tangible result.

13.3. Regarding claim 7, the claim is directed to a computer-readable storage medium on which is recorded a program process. The recorded program process allows the interpretation of source code, which is non-statutory as non-functional descriptive material. The Examiner suggests amending the claim in the spirit of "A computer-readable storage medium on which is recorded executable instructions of a program process ...".

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 1 - 2, 4 - 5, 7 - 10 and 13 are rejected under 35 U.S.C. 103(a) as being

obvious over Nishino et al (U.S. Patent 5,650,935) in view of Otsu et al (U.S. Patent 5,903,477), further in view of Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

15.1. The art of Nishino is directed to calculation of the intensity of an electromagnetic field generated by an electronic device (**Abstract**).

15.2. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device (**column 1, lines 1 - 15**).

15.3. The art of Cheng is directed to calculating an electromagnetic field generated by a generating wave source (**pages 632 - 634, section 11-6.1**).

15.4. Regarding **claim 1**:

15.5. Nishino appears to teach:

15.5.1. a first current calculation device calculating current values (**Figure 4, element 12, and column 7, lines 7 - 9, and Figure 5, element ST5, and column 10, lines 23 - 25**) of the generation source (**column 7, lines 16 - 20**).

15.5.1.1. Regarding **column 7, lines 16 - 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

15.5.2. a current storage device storing the current values of the generation source (**Figure 5, element ST7**(refer to following subsection)).

15.5.2.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it would have been obvious that a current storage device is included that stores the current values of the generation source.

15.5.3. a calculation of currents in an object that receives a radio wave (**Figure 19, element Housing** (refer to following subsection)) by: a second current calculation device calculating current values of the object (**Figure 4, element 13, and column 7, lines 10 – 12, and Figure 5, element ST7, and column 11, lines 19- 21**) using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7, and column 11, lines 19- 21, and Figure 5, element ST6, and column 10, lines 46 – 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants (**Figure 5, element ST7, and column 10, lines 56 – 64**).

15.5.3.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

15.5.4. an output device calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 32 – 36**) and outputting the receiving characteristic of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 22 – 36**).

15.5.4.1. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

15.5.4.2. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is being calculated at multiple observation points, it would have been obvious that the electric/magnetic field being calculated at multiple positional relationships from the generation source.

15.6. Nishino does not specifically teach:

15.6.1. a simulation apparatus.

15.6.2. a first current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.

15.6.3. a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants.

15.6.4. simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance

between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance.

15.7. Otsu appears to teach:

15.7.1. a simulation apparatus (column 23, line 31).

15.7.2. a current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (column 5, lines 54 – 58 (refer to following subsection), and Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (column 5, lines 54 – 58, and Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”).

15.7.2.1. Regarding column 5, lines 54 – 58, it was well known that in the moment method, a generation source is divided into a plurality of elements.

15.8. Cheng appears to teach:

15.8.1. calculating current values of the object using simultaneous equations of the object and a positional relationship between the generation source and object changes

(page 632, figure 11-16; and page 632, section 11-6.1, first paragraph and the figure suggests moving an antenna to a new position).

15.8.2. simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance (**pages 632 – 632, section 11-6.1; Cheng teaches that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (section 11-6.1, page 633), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104), and current values of the receiving characteristic of the object can be calculated separately (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104; since the transmitting and receiving antennas are separated by a large distance, it would have been obvious that there was a threshold distance. Cheng also teaches near and far field approximations of the electromagnetic radiation field on pages 604 – 605; Cheng recites that the transmitting and receiving antennas need to be separated by very large distances in**

*order for the coupling impedance to be neglected as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna (**Cheng, page 633, first paragraph**). The ordinary artisan would have known about the far field approximation of the equations of electromagnetic radiation (**Cheng, page 605**), as opposed to the near field equations (**Cheng, pages 604 – 605**). The near field equations contain $1/R^3$, which can be ignored when R is large (also see **Kraus, "Electromagnetics", 1984, page 626, second paragraph that starts with, "When r is very large . . ."**; and **Ramo, "Fields and Waves in Communication Electronics", 1965, page 644**), which would have been known by the ordinary artisan. Therefore, the ordinary artisan would have used a distance threshold to determine if it was appropriate to use a far field approximation.).*

15.9. The art of Otsu, Cheng and Nishino are analogous art because they are directed to a similar problem solving area: that of calculating an electromagnetic field generated by a generating wave source.

15.10. The motivation for combining the art of Otsu with the art of Nishino would have been the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device (**Otsu, column 1, lines 8 – 15**, and **Nishino, column 1, lines 8 – 11**), which would have been recognized by the ordinary artisan as a computational benefit to save time.

15.11. The motivation to combine the art of Cheng with the art of Nishino would have been the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately because the back reaction of the receiving antenna on the transmitting antenna can be set to zero (**page 634, figure**

11-18), which would have been recognized by the ordinary artisan as providing a computational time saving benefit.

15.12. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino to produce the claimed invention.

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15.13. Regarding **claim 2**:

15.14. Nishino appears to teach:

15.14.1. the second current calculating device includes a device calculating mutual impedance between elements of the object (**Figure 4, elements 13 and 130, and column 6, lines 53 – 55**), a device calculating mutual impedance between an element of the generation source and an element of the object (**Figure 4, elements 13 and 130, and column 6, lines 53 – 57**) and a matrix storage device storing matrix data of mutual impedance between elements of the object (**Figure 5, elements ST6 and ST7**(refer to following subsection)), generates simultaneous equations of the object using the matrix data stored in the matrix storage device as a coefficient matrix (**Figure 5, elements ST6 and ST7 and column 10, lines 56 – 64**) and calculates new current values (**Figure 5, element ST7 and column 10, lines 56 – 64**).

15.14.1.1. Regarding **Figure 5, elements ST6 and ST7**, since the process flow in **Figure 5** displays that the calculated matrix data of mutual impedance between elements of the object in element ST6 are used in the calculations of element ST7, it would have been obvious that a matrix storage device is

included that stores the matrix data of mutual impedance between elements of the object (Figure 5, element ST7).

15.15. Nishino does not specifically teach:

15.15.1. the second current calculating device includes a device calculating mutual impedance between elements of the object, a device calculating mutual impedance between an element of the generation source and an element of the object and a matrix storage device storing matrix data of mutual impedance between elements of the object, calculates mutual impedance between an element of the generation source and an element of the object corresponding to a new position when a position of the generation source changes, generates simultaneous equations of the object corresponding to the new position using the matrix data stored in the matrix storage device as a coefficient matrix and calculates new current values.

15.16. Otsu appears to teach:

15.16.1. a current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58, and Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58, and Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for**

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calculation of current"). (It was well known that in the moment method, a generation source is divided into a plurality of elements).

15.17. Cheng appears to teach:

15.17.1. calculates mutual impedance between an element of the generation source and an element of the object corresponding to a new position when a position of the generation source changes, generates simultaneous equations of the object corresponding to the new position (page 632, figure 11-16, and section 11-6.1, first paragraph).

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15.18. Regarding claim 4:

15.19. Nishino appears to teach:

15.20. a judging device judging whether a calculation method in which the current values of the generation source are regarded as constants can be used, wherein said second current calculation device calculates the current values of the object using the simultaneous equations of the object if the calculation method can be used (Column 7, lines 15 - 27, and Figure 5, element ST3, and column 9, lines 20 - 23).

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15.21. Regarding claim 5:

15.22. Nishino appears to teach:

15.23. a first current calculation device calculating current values (**Figure 4, element 12, and column 7, lines 7 – 9, and Figure 5, element ST5, and column 10, lines 23 – 25**) of a transmitting antenna (**column 7, lines 16 – 20**).

15.23.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a transmitting antenna.

15.24. a current storage device storing the current values of the transmitting antenna (**Figure 5, element ST7** (refer to following subsection)).

15.24.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it would have been obvious that a current storage device is included that stores the current values of the transmitting antenna.

15.25. a matrix storage device storing matrix data of mutual impedance between elements of the object when the object is divided into a plurality of elements (**Figure 5, elements ST6 and ST7**(refer to following subsection), and **column 10, lines 46 – 49**).

15.25.1. Regarding **Figure 5, elements ST6 and ST7**, since the process flow in Figure 5 displays that the calculated matrix data of mutual impedance between elements of the object in element ST6 are used in the calculations of element ST7, it would have been obvious that a matrix storage device is included that stores the matrix data of mutual impedance between elements of the object.

15.26. a device calculating mutual impedance between an element of the transmitting antenna and an element of the object (**Figure 4, elements 13 and 130, and column 6, lines 53 – 57**).

15.27. a calculation of currents in an object that receives a radio wave (**Figure 19, element Housing**(refer to following subsection)) by a second current calculation device (**Figure 4, element 13, and column 6, line 52**) generating simultaneous equations of the object using currents that flow through respective elements of the object as unknowns (**Figure 4, element ST, and column 10, lines 56 – 64**), matrix data stored in the matrix storage device as a coefficient matrix (**Figure 4, element ST, and column 10, lines 56 – 64**) and both the current values stored in the current storage device and the mutual impedance between the element of the transmitting antenna and the element of the object as constants (**Figure 4, element ST, and column 10, lines 56 – 64**), and calculating current values of the object (**Figure 4, element ST, and column 10, lines 56 – 64**).

15.28. a device calculating the directivity characteristic of the object based on the current values of the object (**Figure 5, element ST7, and column 10, lines 56 – 62**(refer to the following subsection)).

15.28.1. Regarding **Column 10, lines 56 – 62**, the calculated currents are the directivity characteristic of the object.

15.29. an output device calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 32 – 36**), the receiving characteristic being calculated at multiple positional relationships from the transmitting antenna, and outputting the receiving characteristic of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 22 – 36**).

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15.29.1. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

15.29.2. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is being calculated at multiple observation points, it would have been obvious that the electric/magnetic field is being calculated at multiple positional relationships from the transmitting antenna.

15.30. Nishino does not specifically teach:

15.31. a simulation apparatus.

15.32. a first current calculation device calculating current values of a transmitting antenna using simultaneous equations of the transmitting antenna when the transmitting antenna is divided into a plurality of elements, the simultaneous equations of the transmitting antenna having currents that flow through respective elements as unknowns.

15.33. a device calculating mutual impedance between an element of the transmitting antenna and an element of the object for each angle of the transmitting antenna against the object.

15.34. a calculation of currents in an object that receives a radio wave by a second current calculation device generating simultaneous equations of the object for each angle of the transmitting antenna using currents that flow through respective elements of the object as unknowns, matrix data stored in the matrix storage device as a coefficient matrix and both the current values stored in the current storage device and the

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mutual impedance between the element of the transmitting antenna and the element of the object as constants, and calculating current values of the object.

15.35. an output device calculating the directivity characteristic of the object based on the current values of the object and outputting the directivity characteristic of the object.

15.36. simultaneous equations of the radio wave transmitted from the transmitting antenna and the simultaneous equations of the directivity characteristic of the object are separated by regarding the current values of the radio wave transmitted from the transmitting antenna as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave transmitted from the transmitting antenna and the current values of the directivity characteristic of the object are separately calculated when the distance between the object and the source is greater than or equal to a threshold distance.

15.37. Otsu appears to teach:

15.38. a simulation apparatus (**column 23, line 31**).

15.39. a current calculation device calculating current values of the transmitting antenna using simultaneous equations of the generation source when the transmitting antenna is divided into a plurality of elements (**column 5, lines 54 – 60, and Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**), the simultaneous equations of the transmitting antenna having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58, and Figure 45, boxes labeled “calculation of mutual impedance” and**

“simultaneous equation for calculation of current”; It would have been obvious that in the moment method, a generation source is divided into a plurality of elements).

15.39.1. Regarding **column 5, lines 54 – 60, and Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**, since the calculated currents are used to calculate an intensity of radiation of an electromagnetic field, it would have been obvious that the device is a transmitting antenna.

15.40. Cheng appears to teach:

15.41. a calculation of currents in an object that receives a radio wave for each angle of the transmitting antenna against the object (**page 632, figure 11-16, and section 11-6.1, first paragraph**).

15.42. calculating the directivity characteristic of the object based on the current values of the object (**page 632, figure 11-16, and section 11-6.1, first paragraph**).

15.43. simultaneous equations of the radio wave transmitted from the transmitting antenna and the simultaneous equations of the directivity characteristic of the object are separated by regarding the current values of the radio wave transmitted from the transmitting antenna as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave transmitted from the transmitting antenna and the current values of the directivity characteristic of the object are separately calculated when the distance between the object and the source is greater than or equal to a threshold distance (**pages 632 – 634, section 11-6.1**).

15.43.1. Regarding (**pages 632 – 634, section 11-6.1**): Cheng teaches that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (**section 11-6.1, page 633**), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**), and current values of the directivity characteristic of an object can be calculated separately (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**; since the transmitting and receiving antennas are separated by a large distance, it would have been obvious that there was a threshold distance. Cheng also teaches near and far field approximations of the electromagnetic radiation field on **pages 604 – 605**; Cheng recites that the transmitting and receiving antennas need to be separated by very large distances in order for the coupling impedance to be neglected as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna (**Cheng, page 633, first paragraph**). The ordinary artisan would have known about the far field approximation of the equations of electromagnetic radiation (**Cheng, page 605**), as opposed to the near field equations (**Cheng, pages 604 – 605**). The near field equations contain $1/R^3$, which can be ignored when R is large (also see Kraus, “Electromagnetics”, 1984, page 626, second paragraph that starts with, “When r is very large . . .”; and Ramo, “Fields and Waves in Communication Electronics”, 1965, page 644), which would have been known by the ordinary

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artisan. Therefore, the ordinary artisan would have used a distance threshold to determine if it was appropriate to use a far field approximation.).

15.44. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino to obtain the invention as specified in claim 5.

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15.45. Regarding **claim 7**:

15.46. Nishino appears to teach:

15.47. a computer-readable storage medium storing a program process (**column 30, line11**).

15.47.1. Regarding **column 30, line11**, it would have been obvious that the medium is computer-readable.

15.48. calculating current values (**Figure 4, element 12, and column 7, lines 7 – 9, and Figure 5, element ST5, and column 10, lines 23 – 25**) of a generation source (**column 7, lines 16 – 20**).

15.48.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

15.49. storing the current values of the generation source (**Figure 5, element ST7**(refer to following subsection)).

15.49.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of

element ST7, it would have been obvious that current values of the generation source are stored.

15.50. calculating currents of an object (**Figure 19, element Housing**(refer to following subsection)) using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7, and column 11, lines 19- 21, and Figure 5, element ST6, and column 10, lines 46 – 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the stored current values as constants (**Figure 5, element ST7, and column 10, lines 56 – 64**).

15.50.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

15.51. calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST9**(refer to following subsection), and **column 11, lines 32 – 35**).

15.51.1. Regarding **Figure 5, elements ST9**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

15.52. outputting the receiving characteristic of the object (**Figure 5, elements ST9, and 21, and column 11, lines 35 – 36**).

15.53. Nishino does not specifically teach:

15.54. calculating current values of a radio wave generation source using simultaneous equations of the generation source when the generation source is divided into a plurality

of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.

15.55. calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the stored current values as constants.

15.56. simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance.

15.57. Otsu appears to teach:

15.58. calculating current values of a radio wave generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58**(refer to following subsection), and **Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58, and Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**).

15.58.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

15.59. Cheng appears to teach:

15.60. calculating current values of the object using simultaneous equations of the object and a positional relationship between the generation source and object changes (**page 632, figure 11-16; and page 632, section 11-6.1, first paragraph and the figure suggests moving an antenna to a new position**).

15.61. simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance (**pages 632 – 632, section 11-6.1; Cheng teaches that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (section 11-6.1, page 633), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104), and current values of the receiving characteristic of the object can be calculated separately (page 634, figure 11-18; and page 633, entire page; and page 634, first**

paragraph and equation 11-104; since the transmitting and receiving antennas are separated by a large distance, it would have been obvious that there was a threshold distance. Cheng also teaches near and far field approximations of the electromagnetic radiation field on pages 604 – 605; Cheng recites that the transmitting and receiving antennas need to be separated by very large distances in order for the coupling impedance to be neglected as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna (Cheng, page 633, first paragraph). The ordinary artisan would have known about the far field approximation of the equations of electromagnetic radiation (Cheng, page 605), as opposed to the near field equations (Cheng, pages 604 – 605). The near field equations contain $1/R^3$, which can be ignored when R is large (also see Kraus, “Electromagnetics”, 1984, page 626, second paragraph that starts with, “When r is very large . . .”; and Ramo, “Fields and Waves in Communication Electronics”, 1965, page 644), which would have been known by the ordinary artisan. Therefore, the ordinary artisan would have used a distance threshold to determine if it was appropriate to use a far field approximation.).

15.62. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino to obtain the invention as specified in claim 7.

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15.63. Regarding **claim 8**:

15.64. Nishino appears to teach:

15.65. calculating current values (**Figure 4, element 12, and column 7, lines 7 – 9, and Figure 5, element ST5, and column 10, lines 23 – 25**) of a generation source (**column 7, lines 16 – 20**).

15.65.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

15.66. storing the current values of the generation source (**Figure 5, element ST7**(refer to following subsection)).

15.66.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it would have been obvious that current values of the generation source are stored.

15.67. calculating currents in an object that receives a radio wave (**Figure 19, element Housing**(refer to following subsection)) using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7, and column 11, lines 19- 21, and Figure 5, element ST6, and column 10, lines 46 – 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the stored current values as constants (**Figure 5, element ST7, and column 10, lines 56 – 64**).

15.67.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

15.68. calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST9** (refer to following subsection), and **column 11, lines 32 – 35**).

- 15.68.1.** Regarding **Figure 5, elements ST9**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.
- 15.69.** outputting the receiving characteristic of the object (**Figure 5, elements ST9, and 21, and column 11, lines 35 – 36**).
- 15.70.** the second current calculating device includes a device: calculating mutual impedance between elements of the object (**Figure 4, elements 13 and 130, and column 6, lines 53 – 55**), calculating mutual impedance between an element of the generation source and an element of the object with matrix data of mutual impedance between elements of the object (**Figure 4, elements 13 and 130, and column 6, lines 53 – 57**) and a matrix storage device storing matrix data of mutual impedance between elements of the object (**Figure 5, elements ST6 and ST7**), generating simultaneous equations of the object using the matrix data stored in the matrix storage device as a coefficient matrix (**Figure 5, elements ST6 and ST7 and column 10, lines 56 – 64**).
- 15.71.** Nishino does not specifically teach:
- 15.72.** determining whether a distance between the object and the source is greater than or equal to a threshold distance.
- 15.73.** calculating current values of a radio wave generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns when the distance between the object and the source is greater than or equal to a threshold distance.

- 15.74.** storing the current values of the generation source when the distance between the object and the source is greater than or equal to a threshold distance.
- 15.75.** calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the stored current values as constants when the distance between the object and the source is greater than or equal to a threshold distance.
- 15.76.** calculating the receiving characteristic of the object based on the current value of the object when the distance between the object and the source is greater than or equal to a threshold distance.
- 15.77.** outputting the receiving characteristic of the object where the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance.
- 15.78.** calculating mutual impedance between elements of the object, calculating mutual impedance between an element of the generation source and an element of the object

with matrix data of mutual impedance between elements of the object when the distance between the object and the source is greater than or equal to a threshold distance.

15.79. calculating mutual impedance between an element of the generation source and an element of the object corresponding to a new position when a position of the generation source changes and when the distance between the object and the source is greater than or equal to a threshold distance.

15.80. generating simultaneous equations of the object corresponding to the new position using the matrix data stored in the matrix storage device as a coefficient matrix and calculating new voltage values using stored current values and the simultaneous equations when the distance between the object and the source is greater than or equal to a threshold distance.

15.81. Otsu appears to teach:

15.82. calculating current values of a radio wave generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58** (refer to following subsection), and **Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58, and Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**).

15.82.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

15.83. Cheng appears to teach:

15.84. determining whether a distance between the object and the source is greater than or equal to a threshold distance (**page 633, first paragraph; since the approximation of $Z_{12} = 0$ is valid when the distance between the antennas is large, it would have been obvious to determine whether the separating distance is above a threshold distance**).

15.85. calculating current values of the object using simultaneous equations of the object and a positional relationship between the generation source and object changes (**page 632, figure 11-16; and page 632, section 11-6.1, first paragraph and the figure suggests moving an antenna to a new position**).

15.86. simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance (**pages 632 – 632, section 11-6.1; Cheng teaches that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting**

antenna owing to scattering by the receiving antenna is concerned (section 11-6.1, page 633), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104), and current values of the receiving characteristic of the object can be calculated separately (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104; since the transmitting and receiving antennas are separated by a large distance, it would have been obvious that there was a threshold distance. Cheng also teaches near and far field approximations of the electromagnetic radiation field on pages 604 – 605; Cheng recites that the transmitting and receiving antennas need to be separated by very large distances in order for the coupling impedance to be neglected as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna (Cheng, page 633, first paragraph). The ordinary artisan would have known about the far field approximation of the equations of electromagnetic radiation (Cheng, page 605), as opposed to the near field equations (Cheng, pages 604 – 605). The near field equations contain $1/R^3$, which can be ignored when R is large (also see Kraus, "Electromagnetics", 1984, page 626, second paragraph that starts with, "When r is very large . . ."; and Ramo, "Fields and Waves in Communication Electronics", 1965, page 644), which would have been known by the ordinary artisan. Therefore, the ordinary artisan would have used a distance threshold to determine if it was appropriate to use a far field approximation.).

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- 15.87.** generating simultaneous equations of the object corresponding to the new position (page 632, figure 11-16; and page 632, section 11-6.1, first paragraph and the figure suggests moving an antenna to a new position).
- 15.88.** calculating new voltage values using stored current values and the simultaneous equations when the distance between the object and the source is greater than or equal to a threshold distance (pages 632 – 634, figure 11-16 and section 11-6.1, especially page 632, section 11-6.1, first paragraph and figure 11-16, and page 633, first paragraph).
- 15.89.** calculating mutual impedance between an element of the generation source and an element of the object corresponding to a new position when a position of the generation source changes (page 632, figure 11-16; and page 634, equation 11-104).
- 15.90.** It would have been obvious that all the limitations of the claim would have only been performed when a distance between the object and the source is greater than or equal to a threshold distance, because as discussed above, the far field approximation of the electromagnetic radiation equations would have only been valid when a distance between the object and the source is greater than or equal to a threshold distance.
- 15.91.** Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino to obtain the invention as specified in claim 8.
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15.92. Regarding **claim 9**:

15.93. Nishino appears to teach:

15.94. preserving the current values of a radio wave generation source (**Figure 5, elements ST5 and ST7** (refer to following subsection), and **column 6, lines 57 – 63**).

15.94.1. Regarding **Figure 5, elements ST5 and ST7**, since the process flow in **Figure 5** displays that the calculated current values in element **ST5** are used in the calculations of element **ST7**, it would have been obvious that the current values of the generation source are preserved.

15.94.2. Regarding **column 6, lines 57 – 63**, since the wave source induces a current in the inapplicable section, the wave source is a radio wave generation source.

15.95. generating simultaneous equations of an object that receives a radio wave (**Figure 19, lines 39 – 60**) according to a position of the object when the object is divided into a plurality of elements (**Figure 5, elements ST6 and ST7**, and **column 10, lines 46 – 64**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the preserved current values as constants (**Figure 5, element ST7**);

15.95.1. Regarding **Figure 19, lines 39 – 60**, since the current through the patch is based on a wave source transmitting radio waves, the patch is an object that receives radio waves.

15.95.2. Regarding **Figure 5, elements ST6 and ST7**, and **column 10, lines 46 – 64**, it was well known that in the moment method, an object is divided into a plurality of elements.

15.95.3. Regarding **Figure 5, elements ST6 and ST7**, and **column 10, lines 46 – 64**, the mutual impedance between the “m” sections for the moment method and “n”

sections for the distributed constant circuit is calculated according to the position of the object.

15.96. calculating current values of the object corresponding to the position of the object using the simultaneous equations of the object (**Figure 5, element ST7, and column 10, lines 56 – 64**).

15.96.1. Since the current values of the object are calculated using the simultaneous equations generated by position (refer to the preceding section), the current values are calculated corresponding to the position of the object.

15.97. calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST7, and column 11, lines 19 – 21**).

15.97.1. Regarding **Figure 5, elements ST7, and column 11, lines 19 – 21**, since the current is a property of the receiving object, it is a receiving characteristic.

15.98. outputting the receiving characteristic of the object on an output device (**Figure 5, elements ST8, ST9, and 21, and column 11, lines 22 – 36**).

15.99. Nishino does not specifically teach:

15.100. a simulation method.

15.101. generating simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.

- 15.102.** calculating current values of the generation source using the simultaneous equations of the object.
- 15.103.** simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance.
- 15.104.** Otsu appears to teach:
- 15.105.** a simulation method (**column 28, line 32**).
- 15.106.** a current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58**(refer to following subsection), and **Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58, and Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**).
- 15.106.1.**Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

15.107. Cheng appears to teach:

15.108. simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance (**pages 632 – 632, section 11-6.1**; *Cheng teaches that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (section 11-6.1, page 633), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104), and current values of the receiving characteristic of the object can be calculated separately (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104; since the transmitting and receiving antennas are separated by a large distance, it would have been obvious that there was a threshold distance. Cheng also teaches near and far field approximations of the electromagnetic radiation field on pages 604 – 605; Cheng recites that the transmitting and receiving antennas need to be separated by very large distances in order for the coupling impedance to be neglected as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna (Cheng, page*

633, first paragraph). *The ordinary artisan would have known about the far field approximation of the equations of electromagnetic radiation (Cheng, page 605), as opposed to the near field equations (Cheng, pages 604 – 605). The near field equations contain $1/R^3$, which can be ignored when R is large (also see Kraus, “Electromagnetics”, 1984, page 626, second paragraph that starts with, “When r is very large . . .”; and Ramo, “Fields and Waves in Communication Electronics”, 1965, page 644), which would have been known by the ordinary artisan. Therefore, the ordinary artisan would have used a distance threshold to determine if it was appropriate to use a far field approximation.).*

15.109. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and Cheng with the art of Nishino to obtain the invention as specified in claim 9.

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15.110. Regarding **claim 10:**

15.111. Nishino appears to teach:

15.112. first current calculation means for calculating current values (**Figure 4, element 12, and column 7, lines 7 – 9, and Figure 5, element ST5, and column 10, lines 23 – 25**) of a generation source (**column 7, lines 16 – 20**).

15.112.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

15.113. current storage means for storing the current values of the generation source (**Figure 5, element ST7** (refer to following subsection)).

15.113.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it would have been obvious that a current storage device is included that stores the current values of the generation source.

15.114. second current calculation means for calculating current values of the object (**Figure 4, element 13, and column 7, lines 10 – 12, and Figure 5, element ST7, and column 11, lines 19- 21**) using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7, and column 11, lines 19- 21, and Figure 5, element ST6, and column 10, lines 46 – 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants (**Figure 5, element ST7, and column 10, lines 56 – 64**).

15.114.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

15.115. output means for calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 32 – 36**), the receiving characteristic being calculated at multiple positional relationships from the generation source, and outputting the receiving characteristic of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 22 – 36**).

15.115.1. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

- 15.115.2.** Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is being calculated at multiple observation points, it would have been obvious that the electric/magnetic field is being calculated at multiple positional relationships from the generation source.
- 15.116.** Nishino does not specifically teach:
- 15.117.** a simulation apparatus.
- 15.118.** first current calculation means for calculating current values of a radio wave generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.
- 15.119.** second current calculation means for calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants.
- 15.120.** simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the

receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance.

15.121. Otsu appears to teach:

15.122. a simulation apparatus (**column 23, line 31**).

15.123. first current calculation means for calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58**(refer to following subsection), and **Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58, and Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**).

15.123.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

15.124. means for calculating current values of the object using simultaneous equations of the object and a positional relationship between the generation source and object changes (**page 632, figure 11-16; and page 632, section 11-6.1, first paragraph and the figure suggests moving an antenna to a new position**).

15.125. simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a

distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance (**pages 632 – 632, section 11-6.1**; *Cheng teaches that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (section 11-6.1, page 633), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104), and current values of the receiving characteristic of the object can be calculated separately (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104; since the transmitting and receiving antennas are separated by a large distance, it would have been obvious that there was a threshold distance. Cheng also teaches near and far field approximations of the electromagnetic radiation field on pages 604 – 605; Cheng recites that the transmitting and receiving antennas need to be separated by very large distances in order for the coupling impedance to be neglected as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna (Cheng, page 633, first paragraph). The ordinary artisan would have known about the far field approximation of the equations of electromagnetic radiation (Cheng, page 605), as opposed to the near field equations (Cheng, pages 604 – 605). The near field equations contain $1/R^3$, which can be ignored when R is large (also see Kraus, “Electromagnetics”, 1984, page 626, second paragraph that starts with, “When r*

is very large . . .”; and Ramo, “Fields and Waves in Communication Electronics”, 1965, page 644), which would have been known by the ordinary artisan. Therefore, the ordinary artisan would have used a distance threshold to determine if it was appropriate to use a far field approximation.).

15.126. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino to obtain the invention as specified in claim 10.

15.127. Regarding **claim 13:**

15.128. Nishino appears to teach:

15.128.1. a first current calculation device calculating the current value of the transmitting antenna (*figure 4, element 12, and column 7, lines 7 – 9, and figure 5, element ST5, and column 10, lines 23 – 25, and column 7, lines 16 - 20*) by solving a first set of simultaneous equations, each equation in the first set representing a current of each of a plurality of elements composing the transmitting antenna (*figure 5, element ST5*), and storing the representative current values (*figure 5, element ST7; since the process flow in figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it would have been obvious that a current storage device is included that stores the current values*);

15.128.2. a second current calculation device extracting the stored current values (*figure 4, element 13 and column 7, lines 10 – 12, and figure 5, element ST7, and column 11, lines 19 - 21*), ~~when a relative position between the transmitting~~

~~antenna and receiving antenna is changes~~, generating a second set of simultaneous equations, each equation in the second set representing a current of each of a plurality of elements composing the receiving antenna, calculating the current value of the receiving antenna by solving the second set of simultaneous equations, and outputting the values (*figure 5, element ST7 and the label "Second current I_i " on the output line of element ST7*);

15.128.3. an output device receiving the output values from the second current calculation device and calculating the receiving characteristic of the receiving antenna using the output values and outputting the receiving characteristic (*figure 5, elements ST8, ST9 and 21*);

15.128.4. a coefficient matrix of the second set of simultaneous equations is composed of only mutual impedance between the elements of the receiving antenna (*figure 5, element ST7, impedance coefficient matrix $[Z_{ij}]$*).

15.129. Nishino does not specifically teach:

15.129.1. an apparatus for simulating a receiving characteristic of a receiving antenna that receives a radio wave transmitted from a transmitting antenna;

15.129.2. ~~a second current calculation device extracting the stored current values,~~
when a relative position between the transmitting antenna and receiving antenna is changes, ~~generating a second set of simultaneous equations, each equation in the second set representing a current of each of a plurality of elements composing the receiving antenna, calculating the current value of the receiving antenna by~~

~~solving the second set of simultaneous equations, and outputting the values;~~

15.129.3. wherein a coefficient matrix of the first set of simultaneous equations is

composed of only mutual impedance between the elements of the transmitting antenna, and

15.130. Otsu appears to teach:

15.131. an apparatus for simulating a receiving characteristic of a receiving antenna that receives a radio wave transmitted from a transmitting antenna (*column 23, line 31*).

15.132. Cheng appears to teach:

15.132.1. when a relative position between the transmitting antenna and receiving antenna is changes (*page 632, figure 11-16, and page 634, sentence below equation 11-105, "For two successive position of antenna B as indicated in Fig. 11-16"*).

15.132.2. a coefficient matrix of the first set of simultaneous equations is composed of only mutual impedance between the elements of the transmitting antenna (*page 633, especially equation 11-100, the coefficient matrix is taken as the input impedance of the transmitting antenna*).

15.133. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino to obtain the invention as specified in claim 13.

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16. Claim 3 is rejected under 35 U.S.C. 103(a) as being obvious over Nishino as modified by Otsu and Cheng as applied to claims **1 - 2, 4 - 5, 7 - 10 and 13** above, further in view of Lay ("Linear Algebra and Its Applications", 1997, David C. Lay).

16.1. Nishino as modified by Otsu and Cheng teaches a simulation apparatus for simulating a receiving characteristic of any object that receives a radio wave transmitted from a radio wave generation source as recited in claims **1 - 2, 4 - 5, 7 - 10 and 13** above.

16.2. Regarding **claim 3**:

16.3. Nishino does not specifically teach:

16.3.1. the second current calculation device further includes a factorization device factorizing the coefficient matrix by a prescribed factorization method and said matrix storage device stores matrix data of a factorized coefficient matrix.

16.4. Lay appears to teach:

16.4.1. factorizing a coefficient matrix by a prescribed factorization method (**pages 133 - 139, section 2.5 Matrix Factorizations**);

16.4.2. stores matrix data of a factorized coefficient matrix (**pages 133 - 139, section 2.5 Matrix Factorizations**);

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- 16.5.** Nishino as modified by Otsu and Cheng, and the art of Lay, are analogous art because they contain a similar problem solving area, that of calculating solutions to sequences simultaneous equations, all with the same coefficient matrix.
- 16.6.** The motivation for combining the art of Nishino as modified by Otsu and Cheng and the art of Lay would have been the knowledge of an ordinary artisan that LU factorization is useful to solve sequences of simultaneous equations, all with the same coefficient matrix, by providing reduced calculation time, which would have provided the expectation of a computational benefit.
- 16.7.** Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Nishino as modified by Otsu and Cheng and the art of Lay to obtain the invention as specified in claim 3.
- =====

17. Claim 6 is rejected under 35 U.S.C. 103(a) as being obvious over Otsu et al (U.S. Patent 5,903,477) in view of Miller (Edmund K. Miller, "A Selective Survey of Computational Electromagnetics", IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, VOL. 36, No. 9), further in view of Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

- 17.1.** The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.
- 17.2.** The art of Miller is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

17.3. The art of Cheng is directed to calculating an electromagnetic field generated by a generating wave source (**pages 632 – 634, section 11-6.1**).

17.4. Otsu and Cheng are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by a generating wave source.

17.5. Otsu and Miller are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic device.

17.6. Regarding **claim 6**:

17.7. Otsu appears to teach:

17.8. a simulation apparatus (**column 23, line 31**).

17.9. an impedance storage device storing data of mutual impedance between elements of a radio wave generation source when the generation source is divided into a plurality of elements (**Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”, and column 5, lines 54 – 58**).

17.9.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

17.9.2. Regarding **Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”**, since the impedance calculated in the box labeled “calculation of mutual impedance” is used in the box

labeled “simultaneous equation for calculation of current”, it would have been obvious that an impedance storage device is used.

- 17.10.** a current calculation device calculating current values using simultaneous equations having currents that flow through respective elements of the generation source as unknowns and having a matrix consisting of the data stored in the impedance storage device (**Figure 45, boxes labeled “calculation of mutual impedance” and “simultaneous equation for calculation of current”, and column 5, lines 54 – 58).**
- 17.11.** an output device calculating the electric field and magnetic field of the generation source based on the current values and outputting the electric field and magnetic field (**Figure 45, box labeled “calculation of electric field and magnetic field”, and symbol labeled “output data”, and column 5, lines 54 – 60).**
- 17.12.** Otsu does not explicitly teach:
- 17.13.** an impedance storage device storing *both* data of mutual impedance between elements of the generation source when the generation source is divided into a plurality of elements and data of mutual impedance between elements of an object that receives a radio wave when the object is divided into a plurality of elements as data independent from a position of the generation source.
- 17.14.** a device calculating mutual impedance between an element of the generation source and an element of the object corresponding to a new position when the position the generation source changes.

17.15. an output device calculating the receiving characteristic of the object based on the current values and outputting the receiving characteristic of the object.

17.16. the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance.

17.17. Miller appears to teach:

17.18. an impedance storage device storing both data of mutual impedance between elements of the generation source when the generation source is divided into a plurality of elements and data of mutual impedance between elements of an object that receives a radio wave when the object is divided into a plurality of elements as data independent from a position of the generation source. (**Page 1299, section c; Miller teaches when an antenna may be evaluated in several positions, it is computationally advantageous to partition the impedance matrix into pieces representing the antenna, the other structure, and their mutual interaction pieces).**

17.19. Cheng appears to teach:

17.20. calculating mutual impedance between an element of the generation source and an element of the object corresponding to a new position when the position the generation source changes (**page 632, figure 11-16, and pages 632 – 634, section 11-6.1,**

especially page 32, section 11-6.1, first paragraph suggests moving an antenna to a new position).

17.21. calculating the receiving characteristic of the object based on the current values and outputting the receiving characteristic of the object (**pages 632 – 634, section 11-6.1**).

17.22. simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when a distance between the object and the source is greater than or equal to a threshold distance (**pages 632 – 632, section 11-6.1; Cheng teaches that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (section 11-6.1, page 633), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104), and current values of the receiving characteristic of the object can be calculated separately (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104; since the transmitting and receiving antennas are separated by a large distance, it would have been obvious that there was a threshold distance. Cheng also teaches near and far field approximations of the**

electromagnetic radiation field on pages 604 – 605; Cheng recites that the transmitting and receiving antennas need to be separated by very large distances in order for the coupling impedance to be neglected as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna (Cheng, page 633, first paragraph). *The ordinary artisan would have known about the far field approximation of the equations of electromagnetic radiation (Cheng, page 605), as opposed to the near field equations (Cheng, pages 604 – 605). The near field equations contain $1/R^3$, which can be ignored when R is large (also see Kraus, “Electromagnetics”, 1984, page 626, second paragraph that starts with, “When r is very large . . .”; and Ramo, “Fields and Waves in Communication Electronics”, 1965, page 644), which would have been known by the ordinary artisan. Therefore, the ordinary artisan would have used a distance threshold to determine if it was appropriate to use a far field approximation.).*

17.23. The motivation for using the art of Otsu with the art of Miller would have been the benefit recited in Miller of a computational advantage to partition the impedance matrix when an antenna must be evaluated in different positions (Miller, page 1299, section c).

17.24. The motivation to combine the art of Cheng with the art of Otsu would have been the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately because the back reaction of the receiving antenna on the transmitting antenna can be set to zero (page 634, figure 11-18), which would have been recognized by the ordinary artisan as providing a computational time saving benefit.

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17.25. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Miller and the art of Cheng with the art of Otsu to produce the invention in claim 6.

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18. **Claims 11 and 12** are rejected under 35 U.S.C. 103(a) as being obvious over Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng), in view of Nishino (U.S. Patent Number 5,650,935).

18.1. Regarding **claim 11**:

18.2. Cheng appears to teach:

18.3. determining whether a distance between the object and the source is greater than or equal to a threshold distance (**page 633, first paragraph; since the approximation of $Z_{12} = 0$ is valid when the distance between the antennas is large, it would have been obvious to determine whether the separating distance is above a threshold distance**).

18.4. calculating current values of a source when the distance between the object and the source is greater than or equal to a threshold distance (**page 634, figure 11-18; and page 633, equation 11-100**).

18.4.1. Regarding (**page 634, figure 11-18; and page 633, equation 11-100**); it would have been obvious to the ordinary artisan at the time of invention to calculate the current values of the source by dividing V_1 by Z_{11} .

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- 18.5. storing the current values as constants when the distance between the object and the source is greater than or equal to a threshold distance (page 634, equation 11-104; and page 634, figure 11-18; and pages 633 - 634).

18.5.1. Regarding (page 634, equation 11-104; and page 634, figure 11-18; and pages 633 - 634); it would have been obvious to the ordinary artisan at the time of invention to store the current values as constants since the value of I_1 is merely substituted into equation 11-104, while the value of Z_L can be changed to calculate a new I_2 .

- 18.6. calculating current values of the object using the constants when the distance between the object and the source is greater than or equal to a threshold distance (page 634, equation 11-104; and page 634, figure 11-18).

18.6.1. Regarding (page 634, equation 11-104; and page 634, figure 11-18); the value of I_1 in equation 11-104 is the constant determined in the previous step.

- 18.7. calculating the receiving characteristic of the object based on the current values of the object (page 634, equation 11-104; and page 634, figure 11-18; the current I_2 is an receiving characteristic).

18.8. Cheng does not specifically teach:

18.9. outputting the receiving characteristic of the object on an output device.

18.10. Nishino appears to teach:

18.11. outputting the receiving characteristic of the object on an output device (figure 5, element ST9 outputting to element 21).

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18.12. The motivation to use the art of Nishino with the art of Cheng would have been the knowledge of the ordinary artisan to output values from a calculation in order to make use of the results of the calculation.

18.13. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Nishino with the art of Cheng for to obtain the invention as specified in claim 11.

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18.14. Regarding **claim 12**:

18.15. Cheng appears to teach:

18.16. determining whether a distance between the object and the source is greater than or equal to a threshold distance (**page 633, first paragraph; since the approximation of $Z_{12} = 0$ is valid when the distance between the antennas is large, it would have been obvious to determine whether the separating distance is above a threshold distance**).

18.17. calculating current values of a source when the distance between the object and the source is greater than or equal to a threshold distance (**page 634, figure 11-18; and page 633, equation 11-100**).

18.17.1. Regarding (**page 634, figure 11-18; and page 633, equation 11-100**); it would have been obvious to the ordinary artisan at the time of invention to calculate the current values of the source by dividing V_1 by Z_{11} .

18.18. storing the current values as constants when the distance between the object and the source is greater than or equal to a threshold distance (**page 634, equation 11-104; and page 634, figure 11-18; and pages 633 - 634**).

- 18.18.1.** Regarding (page 634, equation 11-104; and page 634, figure 11-18; and pages 633 - 634), it would have been obvious to the ordinary artisan at the time of invention to store the current values as constants since the value of I_1 is merely substituted into equation 11-104, while the value of Z_L can be changed to calculate a new I_2 .
- 18.19.** calculating current values of the object using the constants when the distance between the object and the source is greater than or equal to a threshold distance (page 634, equation 11-104; and page 634, figure 11-18).
- 18.19.1.** Regarding (page 634, equation 11-104; and page 634, figure 11-18), the value of I_1 in equation 11-104 is the constant determined in the previous step.
- 18.20.** changing a relative position of the object and the source (page 632, figure 11-16; and page 632, section 11-6.1, first paragraph).
- 18.21.** calculating current values of the object with the changed relative position using the constants when the distance between the object and the source is greater than or equal to a threshold distance (page 632 - 634, section 11-6.1; and page 634, figure 11-18; and page 634, equation 11-104).
- 18.21.1.** the approximation of $Z_{12} = 0$ is valid when the distance between the object and the source is greater than or equal to a threshold distance (page 633, first paragraph).
- 18.22.** calculating the receiving characteristic of the object based on the current values of the object (page 634, equation 11-104; and page 634, figure 11-18; the current I_2 is an receiving characteristic).
- 18.23.** Cheng does not specifically teach:
- 18.24.** outputting the receiving characteristic of the object on an output device.

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18.25. Nishino appears to teach:

18.26. outputting the receiving characteristic of the object on an output device (figure 5, element ST9 outputting to element 21).

18.27. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Nishino with the art of Cheng to obtain the invention as specified in claim 12.

19. Examiner's Note: Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the Applicant in preparing responses, to fully consider the references in their entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner. The entire reference is considered to provide disclosure relating to the claimed invention.

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Conclusion

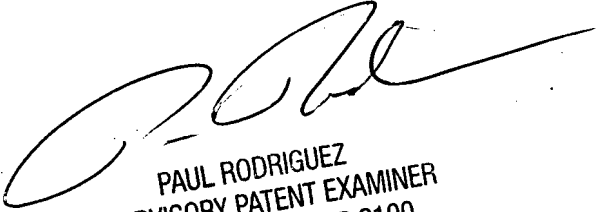
20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russ Guill whose telephone number is 571-272-7955. The examiner can normally be reached from 9:30 AM – 6:00 PM Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Russ Guill
Examiner
Art Unit 2123

RG



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